REMARKS

Claims 1-5, 11-15, 26, 28, 30 and 31 have been examined and stand rejected

New claims 32-38 are hereby added by this Amendment. These claims are supported by, at least, page 10, line 10 through page 12, line 23. These claims are allowable for similar reasons as set forth below with regard to independent claims 1 and 14.

Claim Rejections 35 U.S.C. § 112, First Paragraph

Claims 1-5, 11-15,26, 28, 30 and 31 stand rejected under 35 U.S.C. § 112, first paragraph, as failing to comply with the enablement requirement

In response, Applicants disagree. In particular, the claimed invention is characterized in that, as described in the English specification (page 8, line 21 to page 10, line 21), lack of feature points in right and left images is prevented to improve the visibility of a three-dimensional image and reduce the viewer's fatigue. Toward this end, the definition of a three-dimensional image is set to be greater than the resolution of the viewer. As a result, feature points in images recognizable by the viewer can be represented by a plurality of pixels, thereby preventing non-recognition of feature points by the viewer. When the definition is lower than the resolution of the viewer, pixels cannot eventually represent feature points. In such an event, the visibility of a three-dimensional image is deteriorated, and the fatigue of the viewer increases. These matters are self-evident from the aforementioned section of the English specification.

To verify the effects of the claimed invention, the inventors used two types of image display devices and ten test subjects to conduct a subjective evaluation (page 46, line 5 to page 48, line 8 of the English specification), and the utility of the present invention has been confirmed by this experiment. It has also been confirmed that the aforementioned effects can be produced by improving the definition of a three-dimensional image only in one direction thereof.

Also, in the Response to Arguments section of this Office Action, the Examiner contends that using a liquid crystal display having 200 DPI is well known in the art as taught by Hebiguchi (US 7,301,517). However, Applicants note that merely discloses a 2D display panel and none of the aspects and relationships related to a 3D display as set forth in the claimed invention.

Additionally, Applicants submit that this rejection is in error for the following reasons:

(1) In contrast to the Examiner's assertions, the present specification provides a detailed explanation; and

(2) Whether or not the specification and claims provide the physical rationale or explanation for introducing this number is irrelevant to whether the claims are enabling.

First, the present specification provides:

> Meanwhile, the inventors studied as to until which level the lack of feature points is allowable. To completely prevent the lack of feature points, the definition of the three-dimensional image needs to be no less than the resolution by the eyesight of viewer. This avoids a phenomenon that the viewer cannot view the feature points, which he/she should be able to view, due to low definition of the images and the lack of recognition of the feature points. The relationship between the viewer's eyesight and the minimum viewing angle that the viewer can identify is given by the following expression 2.
>
> (Expression 2)
>
> Eyesight=1/minimum viewing angle (minutes)
>
> General eyesight is 1.0, and the minimum viewing angle of the viewer having eyesight of 1.0 is 1 minute, that is, (1/60) degree, from the above-described expression 2. Then, in this case, the resolution of the viewer at the observation distance D (mm) is D×tan(1 min.)(mm). ***Accordingly, by setting the definition of the three-dimensional image to 25.4/(D×tan(1 min.)(dpi)) or more, the fundamental period of image becomes smaller than the resolution***. Thus, the viewer can view the corresponding feature points, which he/she should be able to view, and consequently,

> he/she can easily recognize the feature points and the lack of feature points can be prevented.

Specification, pp. 10-11 (emphasis added).

As shown by this excerpt, the specification clearly shows how the term tan (1') is used. By using basic trigonometry, the resolution realized by the viewer is equal to D × tan (1') where D is the distance of the display from the viewer. Further, as expressed above, to set the period of the displayed image to a level less than the viewers resolution, the definition of the image should be set to 25.4/(D×tan(1 min.)(dpi)) or more. Applicants respectfully submit this description does, in fact, explain how the definition is related to the term tan (1'). Moreover, there is simply no requirement under 35 U.S.C. § 112 to explain the derivation of every element of basic mathematics used to support an expression. Rather, the specification need only describe the claimed subject matter in sufficient detail that one skilled in the art can reasonable conclude that the inventor had possession of the claimed invention.[1]

Second, the test for enablement is whether the experimentation needed to practice the invention reasonable or unreasonable. Here, the Examiner attempts to support this rejection on the basis of "a lack of enablement" by asserting "that since the specification and claims fail to provide the physical rationale or explanation for introducing this number(tan 1'), the equation is non-enabling. In response, aside from the fact that this number and its derivation are expressly described in the specification, Applicants submit this is not a basis for supporting an enablement rejection. Additionally, because the numerical value of the expression tan 1' is easily ascertainable using a standard calculator, one of skill in the art can easily determine all of the

[1] *See* Moba, B.V. v. Diamond Automation, Inc., 66 USPQ2d 1429, 1438 (Fed. Cir. 2003).

values of the expressions of claims 25-31. Consequently, Applicants submit any required experimentation would be reasonable if not minimal.

Consequently, Applicants respectfully submit that the present specification adequately enables one of ordinary skill in the art to make and use the claimed invention.

Thus, Applicants respectfully request that the Examiner withdraw this rejection.

Claim Rejections - 35 U.S.C. § 103(a)

Claims 1, 3, 11-13, 14 and 30 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Ichinose et al. (US 4,987,487).

In response, Applicants note that the Examiner generally misunderstands the difference between the viewing angle and the irradiation angle of light emitted from a pixel. For example, in the Office Action, the Examiner substitutes 1' into an angle a in FIG. 8 of Ichinose et al. This is improper because in such a setting, the distance is too long between the lenticular lens and a display panel.

Further, within the Office Action, the Examiner alleges, "The definition of the pixel section (UL) therefore is defined with respect to the angular separation of the image light from the adjacent pixel section. *See* page 5 of the Office Action. However, this allegation is erroneous. Rather, the claimed invention is directed to defining the viewing angle of the viewer and the size (definition) of a pixel.

Additionally, Applicants submit the Examiner has failed to establish prima facie obviousness for failing to establish *prima facie* obviousness for the reasons set forth below. Specifically, the Examiner applies a reference Ichinose, which merely contemplates which pixel displays a left image or a right image in order to compensate for the movement of a viewer. Ichinose does not disclose any particular pitch with respect to the minimal angular separation

(1/60 of a degree or one minute) which is discernable by a viewer. Rather, Ichinose is directed to changing which pixels display a right image or a left image to compensate for the right, left, forward and backward movement of a viewer. (col. 8, lines 22-48). Thus, Ichinose's intended use is to permit stereoscopic viewing by a viewer moving side to side and away from the display apparatus. Ichinose does not change the pixel pitch when the viewer moves closer to or further from a display, rather, Ichinose merely changes which pixels display the left and right images.

As a reason to modify Ichinose in view of the minimal angular separation discernable by a human, the Examiner provides the following comments:

> The applicant in particular argues the examiner fails to "articulate any rationale for modifying the definition of a three dimensional image based on the resolution of the eyesight of viewer", in considering the reasons of rejections based on cited Ichinose et al and Momochi references, the examiner respectfully disagrees. One skilled in the art or any ordinary person would understand that in order for the images provided by the pixels to be viewed by an observer with normal eyesight, the smallest separation of the pixels which is referred to be definition of the display, has to be greater than normal eyesight of human being. In fact, a general eyesight for a normal human being is 1.0, which means the minimum angular separation, is 1/60 degree or one minute. This is the limitation of the structure of human eyeball. So to make the definition greater than the normal eyesight of a human being is not irrational and is not hindsight since if such condition is not met then the image displayed by the display device cannot be viewed by an observer. Since the human eye cannot resolve the image.
>
> (*Final Office Action* of April 21, 2008, p. 16).

Failure To Establish Prima Facie Obviousness

In response, Applicants submit the Examiner's purported logical rationale is unsupported. In fact, it is well known that televisions/display monitors come in a multitude of display resolutions with the differences between resolutions being discernable by the human eye, i.e.,

high definition versus standard television viewing. The rationale that the resolution must be greater than that discernable by the human eye for an observer to be viewed is wholly unsupportable.

Further, objective evidence provided by the present inventors disclose that these allegedly obvious resolutions were not obvious or even desired. Specifically, the Examiner insists that raising the definition of an image display apparatus so that it is greater than the resolution by eyesight would have been obvious to one skilled in the art. However, pages 120 and 121 of Reference 1 (Vision Vol. 17, No. 2, pp. 113-122, 2005) (Submitted with the Amendment filed January 14, 2008) discloses "if the results of the study introduced this time are correct, currently where image quality has been improved with the advances in image technology, images have been improved to appear more natural in many points, which is preferable, however, in so far as a stereoscopic image is concerned, it is doubtful whether an improvement in image quality (opposite to defocusing) increases the inconsistency between the accommodation and vergence to easily cause fatigue. In at least an accommodative reaction, a more accurate alignment with the screen surface would have become necessary. However, whether this leads to fatigue is still unknown. It seems that some researchers have such a sense that supports the relationship, however, since we have not asked many researchers about this, its examination will become a challenge in the future." (emphasis added) As far as three-dimensional images are concerned, a higher definition being preferable was not obvious or even desired. The reason is that a higher definition of three-dimensional images was believed to increase the inconsistency between the accommodation and vergence, which may cause fatigue. The inventors et al. eagerly conducted experiments and research in an effort to improve the visibility of three-dimensional images and

reduce the fatigue of the viewer, and they proposed a lower limit of definition for three-dimensional images that could have been a solution to these problems.

In this way, the present inventors discovered that definition is more important for three-dimensional images than for two-dimensional images. In a three-dimensional image, binocular fusion is interrupted by differences between two images, so observers become more sensitive to such differences in three-dimensional image display than in two-dimensional image display. For example, when the display definition is low, the spatial frequency for display decreases, and in turn differences between two images increase. As a result, binocular fusion is interrupted, and the visibility of three-dimensional images decreases significantly.

Thus, Applicants submit modifying the display of Ichinose to produce an image having no less resolution than the eyesight of a viewer was not obvious or even desired by those of ordinary skill in the art.

Further, in the rejection, the Examiner relies on Ichinose, which discloses a method for adjusting or shifting pixel images for a left eye and a right eye in a stereoscopic image display. Ichinose performs the shifting to compensate for the movement of a viewer. To accomplish this adjustment, Ichinose detects the position of a moving body and adjusts the pixel positions for each of the left and right eye so that a proper stereoscopic image may be viewed. (Abstract, col. 1, line 58 through col. 2, line 20). Consequently, pixels displaying the left image may be changed to display the right image so that stereoscopic viewing is maintained. (col. 3, lines 45-55).

The Examiner alleges that Ichinose discloses many of the features recited in claims 1 and 14, but further relies on: (1) unsupported "geometry" based on Applicants' own disclosure; and (2) a further unsupported modification based on the contention that a minimum angular

separation of eyesight of 1.0 or one minute is well known. As noted above, the Examiner has failed to articulate a valid reason as to why one of ordinary skill in the art would modify the pixel pitch in view of the minimum angular separation of the eyesight of a human, especially when the required pitch resolution would change when the viewer moves closer to or further from the display screen.

Within the rejection the Examiner allegedly derives the mathematical relationship $1/L>25.4/(DIS*\tan(a))(dpi)$ based on the disclosure of Ichinose. However, the Examiner concedes that Ichinose fails to teach the recited equation $X\ (dpi) \geq 25.4/(D*0.000291)$. In fact, Ichinose fails to even mention a value which corresponds to X (dpi) dots per inch in relation to the distance D. More specifically, Ichinose fails to even establish any method for calculating how the pixel pitch is determined. Rather, Ichinose is directed to determining the pitch of each lenticular lens within a lenticular lens sheet based on a given pixel pitch array size.

To compensate for Ichinose's deficiencies, the Examiner alleges that it is well-known in the art that general eyesight is 1.0, which means a minimum angular separation, is 1/60 degree or one minute. However, without a valid rationale for doing so, the Examiner plugs this value into the equation $1/L>25.4/(DIS*\tan(a))(dpi)$ to arrive at $X \geq 25.4/(D*0.000291)$ in a fashion similar to that disclosed in the present specification.

However, the resulting equation calculated by the Examiner is based on hindsight gleamed from the present specification. There is simply no support within Ichinose or any other applied reference which supports the Examiners' combination of the minimum angle of separation to determine the recited equation $X\ (dpi) > 25.4/(D*0.000291)$. Nothing, other than hindsight gleamed from the present specification, would lead one of ordinary skill in the art to so modify Ichinose. In fact, reference 1 teaches away from such a modification and the Examiner's

purported rationale based on the unsupported premise that the image could not be viewed unless this resolution is greater than that discernable by an observer.

Applicants submit that the Examiner fails to provide a valid reason to combine the minimum angle of separation with the derived mathematical expression as arranged in the claims. As a basic requirement of obviousness, the Examiner must articulate some rational basis, found either in the references themselves or in the knowledge generally available to one or ordinary skill in the art, to combine the teachings as the Examiner attempts. MPEP §2143. Furthermore, the reason to combine cannot come only from Applicant's disclosure. *In re Vaeck*, 947 F.2d 488 (Fed. Cir. 1991).

However, the Examiner has failed to provide any such reason to combine. Furthermore, the only rational basis to make the combination attempted by the Examiner comes from the Applicants' own disclosure. Specifically, the present Application describes the study and discovery of the unrecognized problem related to the definition of a three-dimensional image and viewer fatigue. (specification, page 8, lines 15-20). As a result of this study, Applicants discovered that the visibility of the three-dimensional images had drastically reduced when the viewer significantly lacks perception of the corresponding feature points in the right and left images, which cause the fatigue. (specification, page 9, lines 2-7) Further, the Applicants discovered that to completely prevent the lack of feature points, the definition of the three-dimensional image need to be no less than the resolution by the eyesight of a viewer. (specification, pages 9 and 10).

Thus, Applicants recognized the problem of viewer fatigue and resolve this by combining the viewing geometries with the minimum viewing angle. While the Examiner appears to derive similar equations within the rejection, Applicants submit that this is a result of hindsight analysis

based on the present specification as the Examiner has failed to provide any rational basis to support the derived combination.

More importantly, the Examiner misconstrues the applied references in this purported combination. Specifically, Applicants note the following errors with the Examiner's application of Ichinose:

(1) In the second paragraph of Page 5 of the Final Office Action, the Examiner provides:

> As demonstrated by Figure 8, the smallest separation between the two adjacent image pixel sections that can be resolved by the eyes so that one image from the first pixel to be directed to the left eye and the other image from the adjacent second pixel section to the right eye is indicated in Figure 8 as L. And the definition of the pixel section is defined as 1/L. From simple geometry one can calculate the definition of the pixel section as the following . . .

As an initial matter, Ichinose fails to support the Examiner's modifications. Indeed, logical analysis set forth below and based on Ichinose shows the Examiner's improper modifications.

First, Ichinose (Fig. 8) describes an irradiation range of light emitted from a pixel and passed through the center of a lenticular lens (in practice, light passed through a part of the lenticular lens other than the center thereof also reaches the right or left eye). A part of the light described in Fig. 8 enters a right or left eye at a predetermined position.

The examiner uses irradiation angles a and b, which are described in Fig. 8, based on a geometrical relationship to produce the following equation:

$L+e = (f+D)\tan(a) = D''\tan(a)$ • • • (1)

Subtracting e from the left side of the equation yields the following equation:

$L < D''\tan(a)$ • • • (2)

Equation (2) is an inequality produced by subtracting e, which is a positive number, from one side of equation (1). This transformation of equation (1) into equation (2) does not have any particular significance. This equation only signifies that the two sides of the equation are not equal due to subtracting the positive number e only from the left side of the equation.

In equation (2), as shown in Fig. 8, "a" is a numerical value that can be obtained from the pixel length D and the focal length of the lenticular lens f and is defined as follows:

$a \tan^{-1}(L/f') \cdots (3)$

Substituting the values described in Ichinose (L = 0.2 mm and f' = 1.56 mm) into equation (3) yields:

$a = 73°$.

This "a" is a value that only determines the focal length of the lenticular lens f' with respect to the pixel length L (or vice versa). When the values of L and f' are set, the value of "a" is automatically determined. Substituting the minimum viewing angle of a viewer whose eyesight is 1.0, which is 1', into "a" is erroneous. While "a" is a value that determines the focal length of the lenticular lens f' with respect to the pixel length L, "1'" is an angle with respect to the viewing angle of a pixel section incident to a right or left eye. These two values are completely different.

The significance of transforming equation (1) into equation (2) in order to yield $X \geq 25.4/(D \times \tan(1'))$, which is described in the present application, is incomprehensible from Ichinoses' disclosure. This transformation of an equation to produce an inequality by subtracting a positive number only from the left side of a geometrically obtained equation is not logically supported. Accordingly, Fig. 8 of Ichinose fails to provide a motivation to produce the equation described in the present application.

As described above, it would not have been obvious to yield the equation described in the present application in light of Ichinose. Also, Ichinose does not provide any description that suggests the equation described in the present application.

(2) In the last paragraph of Page 5 of the Office Action, there is a description "L+e=(f'*tan(a))+(D*tan(b)), for paraxial light, b=a, and tan(a) approximately equals to a in radians and tan(b) approximately equals to b in radians. And if the optical unit is a parallax barrier with slits instead of the lenticular lens, the angle a will be equal to angle b."

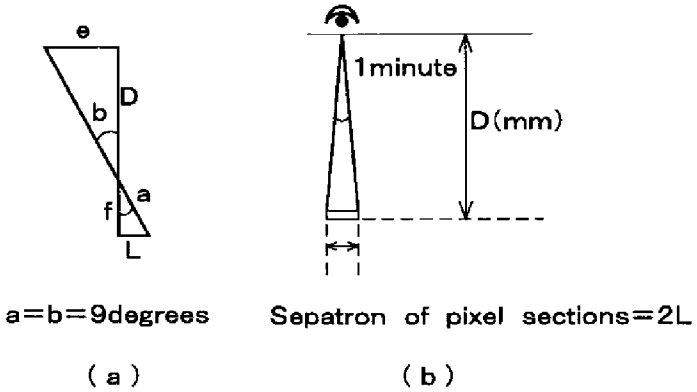
However, why L and e are added is unclear. Notably, the Examiner has failed to provide any rational basis to add L and e. Additionally, even when paraxial approximation exists, it can be said that tan(a) is approximately equal to a and tan(b) is approximately equal to b, but it cannot be said that b=a. Also, the angle of "b" is approximately 9 degrees when a=65mm and D=400mm and not on the order of minutes (one minute=1/60 degrees). Consequently, the Examiner's result here is unsupportable.

(3) There is also a description "if the optical unit is a parallax barrier with slits," however, why the discussion that assumes a parallax barrier is included when calculation of a lens is being discussed is unclear.

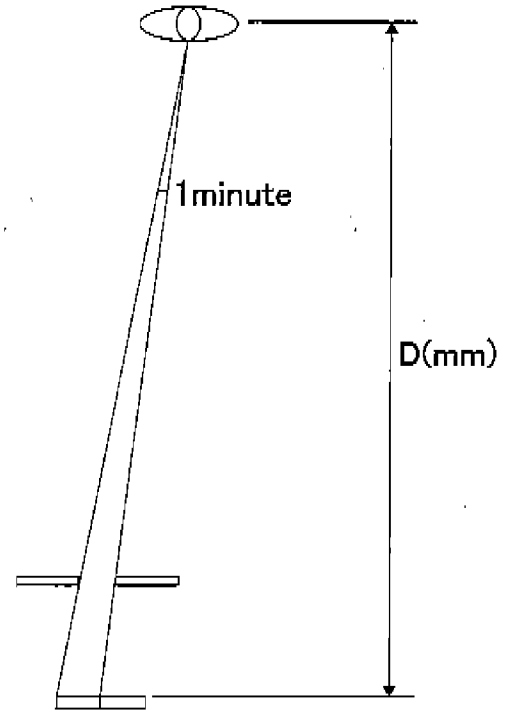
(4) Furthermore, there is a description "(f'+D)*tan(a)" in the 1st line of Page 6 of the Office Action, however, the reason why tan(a) remains despite the assumption that tan(a)=a is unclear. Therefore, the reason for transforming the expression as such is wholly unsupportable.

(5) Furthermore, there is a description "The definition of the pixel section (1/L)" in the 8th line of Page 6 of the Office Action, however, this is not (1/L) but, correctly, (1/2L) as described above.

(6) Furthermore, the Examiner provides, "This means the definition is 1/L>25.4(D'*tan(1')(dpi)." in the 12th and 13th lines of Page 6 of the Office Action, however, the left-hand side is not (1/L) but correctly, (1/2L) as described above. Therefore, the above inequality is unlikely to hold true. Also, with regard to (1') on the right-hand side of the above inequality, the reason why 1' (one minute) comes up here is unclear and unsupported. As described above, the Examiner argues that a=b. If so, "a" must be approximately 9 degrees as described above, and it cannot be one minute (1/60 degrees). Consequently, the Examiner application of "a" and "b" and 1 minute, is illogical. In this way, the Examiner appears to be illogically manipulating Ichinose to arrive at the claimed invention as recited in claims 25-28 and 30-31.



Additionally, in the Examiner's Answer of October 27, 2009, the Examiner alleges that (b) of page 22 of the Appeal Brief (July 14, 2009) is incorrect. The basis for this allegation is the Ichinose and the present application teach that image light from pixels focuses and crosses at the center of a lenticular lens or a slit of a parallax barrier. However, these descriptions refer to the path of light emitted from boundary areas of adjacent pixels. When a display device according to the present invention using a parallax barrier emits light and the light actually reaches a human eye, the path of the light is as demonstrated in the right figure:



The examiner also alleges that design values of an image display device of Ichinose satisfies equation (4). However, as presented below, the image display device of Ichinose does not satisfy equation (4):

$X \geq 25.4/(D \times \tan(1')) \cdots (4)$

Next, substitution of values described in Ichinose (the stereoscopic viewing distance D = 500 mm and pixel length L = 0.2 mm) into equation (4) yields the following:

Left side of equation (4):

X = 25.4 (mm/inch)/L(0.2) (mm)

= 127 (dpi)

Right side of equation (4):

Right side = 25.4/(500 x tan(1'))

= 175 (dpi)

As evidenced by the foregoing, the image display device of Ichinose does not satisfy equation (4) of the present application.

(7) Finally, in the 17th to 20th lines of Page 9 of the Office Action, there is a description "The smallest separation ... is indicated in Figure 7 as Δ." However, in FIG. 7 of cited reference U.S. 5,528,420, Δ indicates the pitch (separation) of one of the pixels of a pixel section, and the pixel section has a pitch of q, and thus, q=3Δ.

Consequently, as set forth above, because the Examiner's reading of the applied references is erroneous, and the subsequent derivations in the Office Action are not supported by any logical rationale, Applicants submit the Examiner has failed to provide the necessary objective evidence to establish a *prima facie* case of obviousness, and therefore, the rejection of claims 1, 3, 11-14 and 30 is in error and should be withdrawn.

Even If Combined As Suggested Not All Claim Features Disclosed

Second, even if modified as suggested by the Examiner, Ichinose fails to teach or suggest, at least, "wherein the pixel sections are arrayed such that a number of pixel sections per inch in the horizontal direction is configured such that a resolution of the image in the horizontal direction as projected in the three-dimensional visible range when D(mm) is defined as the distance between said display panel and a point which is most distant from said display panel within said three-dimensional visible range, the number of pixels sections per inch (X) in said horizontal direction, the distance D and the definition X are set to satisfy the equation below, so that viewing angles of images of pixel sections incident to the right and left eyes are smaller than or equal to tan (1'):

$X \geq 25.4/ D*tan (1')$," as recited in claims 1 and 14.

Specifically, Ichinose does not mention or even contemplate the resolution of the eyesight of a viewer. Rather, Ichinose is directed to producing the three-dimensional image properly to a viewer who moves left or right in a horizontal direction. In particular, Ichinose detects the binocular position of the viewer using a detection means so that the proper pixel for the left eye image is always incident on the left eye and the proper pixel for the right eye image is always incident on the right eye. (col. 1, lines 60-67; col. 4, lines 10-23). Specifically, Ichinose discloses:

> [T[he right and left image array control circuit 25 forms a signal for controlling an array of a combined image on the display device based on a binocular position signal as an output from the binocular or head position detecting circuit 24 which detects the binocular or head position of the viewer, and applies the signal to the multiplex circuit 23 to control a combination of the binocular signals. The resultant signal is applied to the stereoscopic display device 26 to control an array of R and L pixels on the combined image 1, as shown in FIGS. 3 or 4. Therefore, the viewer can experience stereoscopic viewing even if he or she moves to the right or to the left.

(col. 5, lines 45-58).

Accordingly, Ichinose is directed to changing which pixels display a particular portion of the image in response to the left and right movement of a viewer. To the contrary, claims 1 and 14 are directed to the number of pixel sections per inch in the horizontal direction beings configured such that a resolution of the image in the horizontal direction as projected in the three-dimensional visible range is no less than the resolution of the eyesight of a viewer in order to prevent a lack of feature points. Consequently, the resolution of the eyesight of a viewer is not contemplated or mentioned in Ichinose. Further, assuming, *arguendo*, one of ordinary skill in the art would recognize the that general eyesight is 1.0, which means the minimum angular

separation is one minute, even if this is combined with Ichinose, the combination fails to disclose any relationship between the "definition of the three-dimensional image in the horizontal direction" and "resolution by the eyesight of a viewer." In other words, Ichinose and the Examiner alleged well-known eyesight of a viewer, at most, would disclose the following:

(1) the resolution of the eyesight of a viewer is one minute (Examiner's contention); and

(2) changing which pixels display left and right images based on the movement of a viewer (Ichinose).

Accordingly, there is absolutely no disclosure related to the resolution of a viewer and the definition of a three-dimensional image.

Thus, because this feature is not disclosed or contemplated even if the reference is modified in view of the resolution of viewer being one minute, Applicants submit claims 1 and 14 are allowable over the suggested modification of Ichinose. Additionally, Applicants submit claims 3, 11-13 and 29-30 are allowable, at least because of their dependency.

Claim Rejections - 35 U.S.C. § 103(a)

Claims 2, 4, 15, 26, 28 and 31 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Ichinose as applied to claims 1 and 14, in further view of Isono et al. (US 5,315,377).

Because Isono, either taken alone or in combination with Ichinose, fails to compensate for the above noted deficiencies of Ichinose as discussed above, Applicants submit that claims 2, 4, 15, 26, 28 and 31 are allowable by virtue of their dependency.

Additionally, on page 7 of the Office Action, the Examiner contends "[i]t is implicitly true for square or rectangular type of pixel section, the same definition analysis disclosed above

also applied for the vertical direction of the matrix to allow the image being resolved by the eyes of the observer to achieve stereoscopic viewing."

In response, Applicants previously submitted a reference (Reference 1) (Vision Vol. 17, No. 2, pp. 113-122, 2005), which provides objective evidence, that it had not always been considered that, when perceiving a three-dimensional image, an image having a higher resolution in the vertical and horizontal directions is preferable for visual perception.

In Reference 1 (Vision Vol. 17, No. 2, pp. 113-122, 2005), there is a description "As a feature different from that in a natural environment or of a two-dimensional image, a vergence or a retinal image difference occurs in a stereoscopic image due to provision of a binocular disparity and a visual object appears to protrude. However, the image exists on the screen surface, and misalignment with the screen surface in accommodation results in defocusing of the image. When this inconsistency in stimulation between the vergence and accommodation is considered to be the cause for fatigue, it goes well with the feature of the stereoscopic image. (Page 114 to Page 115)," there is a description "... a demand for accommodation due to defocusing was decreased. As a method for this, employed was a simple method for defocusing from a focusing mark ... the results indicate that the accommodative reaction approximates the position of protrusion in accordance with further defocusing from the mark. This can be understood that the demand for accommodation due to defocusing is weakened according to the defocusing. (Page 119), and there is a description "... if the results of the study introduced this time are correct, currently where image quality has been improved with the advances in image technology, images have been improved to appear more natural in many points, which is preferable, however, in so far as a stereoscopic image is concerned, it is doubtful whether an improvement in image quality (opposite to defocusing) increases the inconsistency between the

accommodation and vergence to easily cause fatigue. In at least an accommodative reaction, a more accurate alignment with the screen surface would have become necessary. However, whether this leads to fatigue is still unknown. It seems that some researchers have such a sense that supports the relationship, however, since we have not asked many researchers about this, its examination will become a challenge in the future (Page 120 to Page 121)."

As described in this Reference 1, it is not always a matter of course that a three-dimensional stereoscopic image would preferably has a high definition. Furthermore, this Reference 1 was published in 2005, where it could not be positively stated that a three--dimensional image should preferably have a high definition even after the elapse of two years since the priority date of the present application. This is objective evidence of the prevailing sentiment at a period of time following this priority date. Applicants submit this Reference 1 is objective evidence rebutting the Examiner purported case of *prima facie* obviousness.

Moreover, only as a result of repeated diligent experiments and study of the relationship between the definition of a stereoscopic image and viewer fatigue, as described in the specification of the present application, the inventors of the present invention obtained findings that it has been discovered that the visibility of the three-dimensional images had drastically reduced when the viewer significantly lacks perception of the corresponding feature points in the right and left images, which causes fatigue. Specifically, when the right and left eyes perceive images having a parallax from each other, the viewer searches for corresponding feature points. At this time, when the image significantly lacks feature points, the right and left images cannot correspond to each other, which causes viewer confusion. This confusion leads to binocular rivalry as to which of the images observed by the right and left eyes has priority. Since a condition with binocular rivalry is an unstable condition where binocular fusion is impossible,

the visibility of the three-dimensional images drastically reduces, and the viewer experiences fatigue. Therefore, for making stereoscopic viewing easy in order to reduce viewer fatigue, it is sufficient to prevent the lack of corresponding feature points in the right and left images. This allows the viewer to easily find the corresponding feature points in the right and left images, so that binocular rivalry can be prevented, and binocular fusion can consequently be easily attained.

Concretely, the constitution and effects have been reached as the inventors of the present invention have examined to what extent the lack of feature points can be permitted. In order to completely prevent the lack of feature points, it is necessary that the degree of definition of the three dimensional image be no less than the resolution of the eyesight of a viewer. This allows avoiding the phenomenon that the feature points that could have been perceived by the viewer cannot be perceived due to a low definition of the image so that the viewer lacks recognition of the feature points.

It has conventionally been a concern that the inconsistency between the vergence and accommodation may increase due to a high definition of the three-dimensional image and lead to fatigue. In order to cope therewith, the inventors of the present invention have discovered that fatigue can be reduced from a different viewpoint of a prevention of confusion in a feature point search and thus completed the present invention.

In Reference 1 described above, employed was a simple method for displaying a focusing mark in a defocused manner so as to decrease the demand for accommodation due to defocusing. In such a simplified case using a mark, since the number of feature points in an image is small in the first place, even if the definition is lowered by defocusing, the right and left images can easily correspond to each other, so that the possibility of leading to binocular rivalry is considerably lowered.

On the other hand, in the present invention, a more realistic stereoscopic image is used as shown in, for example, FIG. 1. In such a display, since a large number of feature points exist, when the ratio of lacking increases due to a decline in definition, the right and left images can no longer correspond to each other to lead to binocular rivalry, so that the viewer experiences fatigue due to confusion. That is, in realistic three-dimensional images such as images that the viewer sees usually, it is important to prevent a lack of feature points.

Therefore, in such a stereoscopic image, the following three conditions exist. First, a condition where the definition is lowered such that most of the feature points are lacking, second, a condition where the definition is improved so that almost half of the feature points are not lacking, and third, a condition where the definition is improved no less than the resolution of the eyes so as to prevent a lack of feature points.

In the first condition, as described in Reference 1, the inconsistency between the vergence and accommodation is reduced, so that viewer fatigue may be reduced. In the second condition, since the inconsistency between the vergence and accommodation is further increased and confusion also occurs at the time of a feature point search, viewer fatigue increases. On the other hand, in the third condition, since a search for feature points becomes easier despite an increase in the inconsistency between the vergence and accommodation, fatigue is comprehensively reduced. As such, with regard to the relationship between the definition of a three-dimensional image and an improvement in visibility, the visibility level relative to a change in definition has an inflection point, so that even though the definition is high, the visibility level is not improved, but is conversely lowered unless the definition is made equal to or higher than a predetermined definition. The present invention has presented a lower limit of the definition from such a viewpoint.

Moreover, in the present invention, the definition in the vertical and horizontal directions has been improved to the same extent, and as described in the specification of the present application, in the two directions orthogonal to each other of a display panel, the arrangement cycle of the respective pixels becomes not less than the viewer's minimum viewing angle, so that a lack of corresponding feature points in the right-eye and left-eye images can be more completely prevented, and as a result, the visibility of a three-dimensional image is further improved, and viewer fatigue can further be reduced.

Consequently, the above effects are enabled by the finding of the present invention that "preventing a lack of feature points can reduce viewer fatigue," and could not have been easily anticipated by those skilled in the art based on the conventional arts.

Thus, Applicants submit the Examiner's purported combination is unsupported for these additional reasons. Therefore, claims 2, 4, 15, 26, 28 and 31 are submitted to be allowable for at least this reason.

Claim Rejections - 35 U.S.C. § 103(a)

Claim 5 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Ichinose as applied to claim 1, in further view of Chikazawa (US 5,852,512).

Because Chikazawa, either taken alone or in combination with Ichinose, fails to compensate for the above noted deficiencies of Ichiose as applied to claim 1, Applicants submit claim 5 is allowable, at least by virtue of its dependency.

Claim Rejections - 35 U.S.C. § 103(a)

Claims 1, 3, 11-14 and 30 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Momochi (US 5,528,429) in view of Ichinose.

Because Momochi, either taken alone or in combination with Ichinose, fails to compensate for the above noted deficiencies of Ichinose as discussed above, Applicants submit claims 1 and 14 are allowable, at least for the same reasons set forth above. Additionally, Applicants submit claims 1, 3, 11-14, 16 and 29-30 are allowable, at least by virtue of their dependency.

Claim Rejections - 35 U.S.C. § 103(a)

Claims 2, 4, 15, 26, 28 and 31 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Momochi (US 5,528,429) in view of Ichinose as applied to claims 1 and 14 above, and in further view of Isono (US 5,315,377).

Because Isono, either taken alone or in combination with Momochi and Ichinose, fails to compensate for the above noted deficiencies of Ichinose as discussed above with regard to claims 1 and 14, Applicants submit claims 2, 4, 15, 26, 28 and 31 are allowable, at least by virtue of their dependency.

Claim Rejections - 35 U.S.C. § 103(a)

Claim 5 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Momochi and Ichinose as applied to claims 1, and in further view of Chikazawa.

Because Chikazawa fails to compensate for the above noted deficiency with regard to the Momochi/Ichinose combination, Applicants submit that claim 5 is allowable, at least because of its dependency.

Conclusion

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,

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